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Subject: Bark Beetle Activity in Recreation Sites on the Apache-Sitgreaves NFs
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To: District Ranger, Black Mesa RD, District Ranger, Lakeside RD

I was requested to assess bark beetle activity in developed recreation sites on the Black Mesa and Lakeside RDs, Apache-Sitgreaves NFs. On September 9–12, 2003, I traveled to the Districts to evaluate and discuss prevention and suppression projects in recreation sites with District staff (Sharon Wallace, Lakeside RD; Gayle Richardson, Black Mesa RD). I describe in this report what bark beetle activity was observed in these areas, summarize the effectiveness of the preventive spray project, and make recommendations to minimize bark beetle impacts in the future.

Bark beetle activity on the Apache-Sitgreaves NFs

Aerial detection surveys conducted by our Forest Health Protection zone office in 2002 found relatively high levels of bark beetle-killed ponderosa pine on the Apache-Sitgreaves NFs. A detailed summary of the aerial detection survey results for 2003 will be provided to the Forest at a later date; however, *Ips*-caused mortality of ponderosa pine was found on approximately 110,000 acres, totaling almost $\frac{1}{4}$ million trees killed in 2002. This pine mortality is not unique to the Apache-Sitgreaves NFs. High levels of both ponderosa and piñon pine mortality have been documented across the state and throughout the Southwest during 2002. Within many of these areas, ponderosa pine mortality is already greater than 25% for a given stand and as high as 90% in others. The vast majority of this pine mortality is related to the ongoing drought that the Southwest Region has been experiencing since 1996. If beetle populations continue to increase at the rate they have over the past few years, we can expect to see even greater levels of mortality throughout much of the forest.

Inspection of fading trees and collected specimens determined that the pine engraver beetle (*Ips pini*) is the primary cause of ponderosa pine mortality on the Lakeside RD and much of the Black Mesa RD. This bark beetle is widespread throughout the West and can occasionally reach outbreak proportions (Kegley, et al., 1997). On the west side of the Black Mesa RD (i.e., Rim Lakes Recreation Area), another species of *Ips* (*I. lecontei*, Arizona 5-spined ips) was recently collected from 2 large pockets of mortality. This *Ips* species is considered to be an aggressive ponderosa pine killer below the Mogollon Rim (Massey and Parker, 1981; Parker, 1991) and has caused extensive tree mortality on the Prescott and Tonto NF's during 2002. Many of the larger-diameter pine with top-kill also have western pine beetle (*Dendroctonus brevicomis*) in the lower portion of the trunks. Populations of this bark beetle appear to be increasing throughout much of Arizona in 2003. Other bark beetles species are present in ponderosa pine forests across the Forest, but are not considered tree killers (i.e., red turpentine beetle (*D. valens*)) or are at very low populations (i.e., other *Ips* species and roundheaded pine beetle (*D. adjunctus*)).



Bark beetle activity in developed recreation sites

Trees growing in developed recreation sites are often stressed due to repeated damage caused by campers and soil compaction caused by roads and large vehicles parked off-road. During periods of drought or below-average precipitation, such has been occurring over the last few years, these trees can become extremely stressed. This is further exacerbated by the relatively high density of ponderosa pine growing in several of the campgrounds. When trees are growing at high densities, there is a greater amount of inter-tree competition for limited resources such as light, water, and nutrients (Kolb, et al., 1998). The combined effect of these factors is lower production of defensive compounds by the trees and, consequently, increased susceptibility to bark beetle attack. Bark beetles may also prefer these dense stands, as compared to more open stands, due to microclimate differences (Amman and Logan, 1998).

From September 9 through 12, I examined nearly all developed recreation and administrative sites on both the Lakeside and Black Mesa RDs. I conducted a similar survey of these same sites last October 2002 (site visit report dated October 22, 2002). In general, bark beetle activity increased significantly in recreation sites along the Mogollon Rim on the western side of the Black Mesa RD. Bark beetle activity at recreation sites in other parts of the Districts appeared to be similar to 2002. It is important to note that additional tree mortality may become apparent in these sites later this fall. A brief summary is provided for each site.

Black Mesa RD – Most recreation sites on the District are comprised of densely stocked ponderosa pine stands. Pines in many of the campgrounds have high levels of dwarf mistletoe infection. Thinning projects are planned for 3 of the recreation sites: Sinkhole CG, Canyon Point CG, and Rim CG. The prescription will be: removing trees less than 6 inches dbh while maintaining a 10 ft. by 10 ft. spacing, plus remove all dead and dying pine less than 9 inches dbh. When selecting trees for thinning, attention should be paid to dwarf mistletoe-infected trees. Most recreation sites throughout the District have had many of the dead and dying trees larger than 9 inches dbh already marked for harvest this fall. The District is planning on piling and burning this material during the winter using an Air Curtain Burner, if available. Completion of these projects is dependent upon funding resources and personnel availability.

Black Mesa District Office – Twenty-eight infested trees were seen within the immediate area of the compound. Additional areas of bark beetle activity were observed just outside the compound area. No trees that were sprayed were attacked. Most of the bark beetle activity was occurring in areas that had not been thinned.

Camp Shadow Pines – Approximately 80 small- to medium-diameter infested pines were observed behind the “Pines, Briarwood, and Oaks” cabins. Additional mortality was noted behind the sport fields.

Black Mesa Work Center – One current infested pine was seen in between the work center and the Camp Shadow Pines Ramada.

Canyon Point Campground, Large Group Area, and Small Group Area – Approximately 75 large-diameter pines are currently infested throughout this site and immediately adjacent. None of these trees had been sprayed. Many additional pockets of infested, small-diameter pine were observed throughout. The planned thinning and dead and dying removal treatments will greatly improve conditions in this recreation site.

Rim Campground – Approximately 155 small to large-diameter trees are currently infested within the vicinity of this recreation site. The planned thinning and dead and dying removal treatments will greatly improve conditions in this recreation site.

Sinkhole Campground – Sixty-five small- to large-diameter trees were attacked within the immediate vicinity of this recreation site. The planned thinning and dead and dying removal treatments will greatly improve conditions in this recreation site. Other pockets of mortality were seen within the area and along the road to Willow Springs Lake.

Woods Canyon Group Area – Fifteen current infested and 10 old infested pines were observed.

Woods Canyon Store – Fifteen current infested pine were observed in the middle of the parking circle adjacent to the store.

Rocky Point Day Use Area – Two medium diameter pines were attacked near the parking area of this recreation site.

Aspen Campground – Approximately 300 medium- to large-diameter trees and 200 small-diameter trees were attacked within and immediately adjacent to the large recreation site. Several older dead trees that should be considered hazard trees were also seen. Many of the trees attacked were heavily infected with dwarf mistletoe.

Crook Campground – Approximately 140 small- to large-diameter trees were attacked within the immediate vicinity of this recreation site. Additional mortality was noted in adjacent areas.

Mogollon Campground – Approximately 200 small- to large-diameter trees were attacked within the immediate vicinity of this recreation site. Two of these were marked as sprayed. Beetles were collected from trees at this site and later identified as *Ips lecontei*. All life stages (eggs, larvae, pupae, and adults) were present at this site.

Spillway Campground, Spillway Group Area and Amphitheater – Approximately 30 infested trees behind site #5 and another pocket of dying small-diameter pine by spillway were seen.

Al Fulton Recreation Area – Heavy tree mortality was seen throughout sites #1 through #10 and near #44 and #45.

Rim Visitor Center – Approximately 100 infested pine trees were recorded throughout the Visitor Center area (**Figure 1**). Four trees near the parking lot restroom that were marked as sprayed showed signs of fading from the top down. None of the trees sprayed around the actual Visitor Center were attacked.

Black Canyon Rim

Campground – Three current infested large-diameter pines were present and two pockets of infested small-diameter pine. Most of the trees within the campground were only lightly burned during the Rodeo-Chediski Fire. Removing the small-diameter pine around the larger trees will improve the vigor of the remaining trees.

Gentry Picnic Area –

Approximately 12 trees that were partially burned during the Rodeo-Chediski Fire had died and were infested with beetles. Fire crew personnel were felling these trees while I visited the site. Other bark beetle activity was present outside of the recreation site.

Rim Top Trailhead – Two pockets of small-diameter pine were infested near the parking area. No mortality of large-diameter trees was observed.

Lakeside RD – In addition to some of the sites being comprised of densely stocked ponderosa pine stands, several of the recreation sites on the Lakeside RD are a mixture of piñon pine-juniper-ponderosa pine stands. Similar to the Black Mesa RD, ponderosa pines in some of the campgrounds have high levels of dwarf mistletoe infection.

Lakeside District Office – A total of five current infested pines were detected on the compound. Two of these trees were already cut and removed. One of these trees was sprayed; however, it was likely already infested before spraying took place, as it was adjacent to a group of three trees that were infested last year and not removed until after beetles had emerged. Additional mortality was observed within the vicinity.

Lakeside Campground – Five small-diameter and two large-diameter infested pines were found in the campground. One of the large-diameter trees, near site #41, was sprayed and is exhibiting top-kill, while none of the infested trees had been sprayed.

Los Burros Campground - Seven current infested large-diameter pines were found near the entrance and within the campground. Three old infested pines were also found. I also observed some old infested trees that had been felled but not treated.

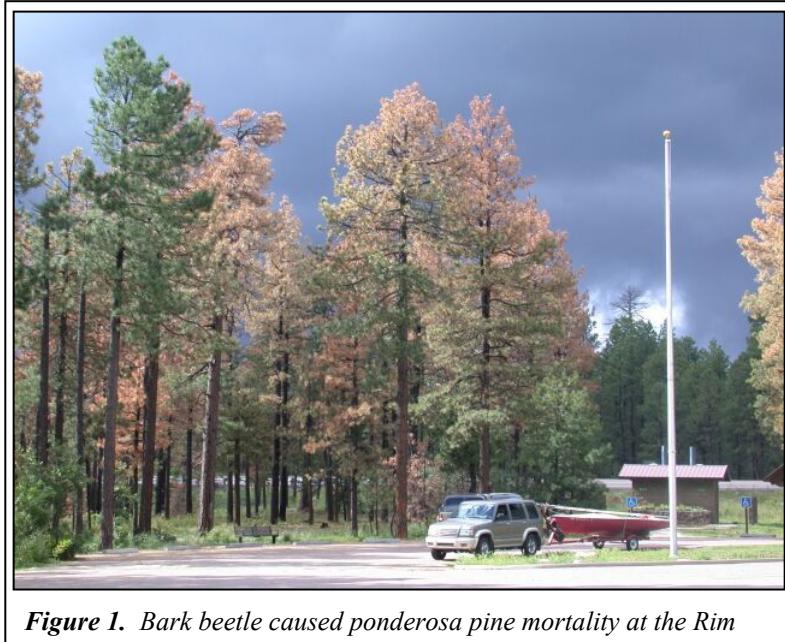


Figure 1. Bark beetle caused ponderosa pine mortality at the Rim Visitor Center, Black Mesa RD, Apache-Sitgreaves NF.

Brown Creek Overflow Area - No current beetle activity was seen within the immediate vicinity of this recreation area. Removing the small-diameter pine around the larger trees will improve the vigor of the remaining trees.

Scott Reservoir Campground – No current beetle activity was seen within the immediate vicinity of this recreation area. Scattered ponderosa pine mortality is occurring across the lake from the campground. Fortunately, this campground is mostly made up of piñon pine and juniper, which will provide screening between campsites.

Mogollon Trailhead – Several current infested ponderosa pines and piñon pine were detected along the end of the trail.

Big Springs Environmental Study Area – Several current and old infested ponderosa pines were seen along the trail.

Woodland Lake Park – Several small pockets of currently infested and old infested small- to medium-diameter pine. Much of the pine is infected with dwarf mistletoe, which in combination with the high density of trees makes these trees highly susceptible to attack. I also observed several small- to medium-diameter pines that had been felled and left on the site during the summer. This material had been infested or is currently infested with *Ips*.

Fool Hollow Lake – Large areas of infested pines were observed on park grounds. In speaking with Jim Wilson, Recreation Area Manager for Fool Hollow Lake, I was informed that the infested trees would be cut and chipped or removed from the area this fall. In addition, limited thinning of small-diameter pine may occur.

Lewis Group Area – A total of 5 current infested trees were found within the campground. Of these, 2 were large-diameter trees that had apparently been sprayed; however, 1 had been fire-scorched significantly (i.e., more than 50% of the entire bole was scorched) and the other had fire scorch at the base and was exhibiting top-kill only. Most of the adjacent forested area that had been more severely burned was severely infested with *Ips* and western pine beetle.

Pinedale Work Center – Three currently infested pines were observed on work center grounds. An additional 4 trees were cut that had likely been infested earlier this year. These cut trees were either lopped or stacked, but not treated. Some of this material still had beetles present. None of the sprayed trees were attacked.

Prevention and control alternatives for bark beetles

A full description of prevention and control alternatives was described in last year's site visit report (dated October 22, 2002). I describe here the effectiveness of this year's spray project.



Figure 2. Top-kill of ponderosa pine sprayed at Lakeside CG, Lakeside RD.

Trees were sprayed with Sevin SL at 9 recreation and administrative sites across the 2 Districts during late April and early May. In general, the spray seemed to be very effective at preventing trees from being successfully attacked by beetles. Only 9 trees out of more than 1,700 trees sprayed were successfully attack by *Ips* species despite heavy beetle pressure in many of the areas treated. Of these 9 attacked trees, 6 were only attacked at the top of the bole, suggesting that the spray had not adequately reached the tops of trees in some cases. One of the attacked trees at Lewis Canyon Group Area had been fire-scorched significantly (i.e., more than 50% of the entire bole was scorched) and the other had fire scorch at the base and was exhibiting top-kill only. One of the trees sprayed at the Lakeside RD was likely already infested before spraying took place, as it was adjacent to a group of 3 trees that were infested last year and not removed until after beetles had emerged. The two infested trees that were sprayed at Mogollon Campground were likely attacked in late August or early September.

While spraying was being conducted, our office put out water-sensitive spray cards to monitor drift of spray material. Cards were attached to holders that were placed in 3 radiating spokes downwind from the base of a spray tree at 5, 50, and 100 feet. Cards were collected after spraying and pictures taken (*Figure 3*). The vast majority of spray material was deposited on the target tree or less than 50 feet. Virtually no material was detected at 100 feet when wind speed was less than 7 mph at ground level.

If spraying will be conducted in 2004, marking trees that have been sprayed will facilitate post-treatment evaluation.

Recommendations

Because the current beetle infestation is occurring on the landscape scale and is largely a result of the ongoing drought, it is essentially impossible to control the beetle population as a whole through management actions. Therefore, control actions should be limited to the most critical, high-value areas that have adequate accessibility.

Based on the current weather and stand conditions, setting, and large population of bark beetles within the immediate area, trees within many of the campgrounds continue to be highly susceptible to beetle attack. Therefore, a combination of removal of infested trees, application of preventive insecticide sprays, and thinning is recommended for many of the sites.

The thinning prescription for removing the smaller-diameter trees at three of the sites on the Black Mesa RD and treatment of dead and dying at other sites will improve the growing conditions for the residual trees and help to lower the local population of beetles. When carrying out this thinning prescription, careful management of the slash should be considered while populations are high. Removal of thinning slash from the recreation areas is the best option. If treated on-site, burning, chipping, or burying green will help to reduce the potential for an



Figure 3. Water sensitive spray cards placed 5, 50 and 100 ft (left to right) downwind from tree base. Blue color indicates where spray landed on the cards.

additional population increase of beetles. It is recommended that the infested trees be removed or treated before early spring (i.e., by April 1st), which is prior to the brood completing their development and adult beetles emerge.

Because of the extent of work that needs to be completed and because of other high-priority commitments on both Districts, the completion of all recommended treatments may not be feasible in the coming year. If requested, I can work with your staff to help develop priority strategies.

Funds may be available for FY2004 from Forest Health Protection to deal with bark beetle activity. Requests for these funds should be in no later than October 22, 2003.

If you have any questions regarding my assessment of current bark beetle activities within the project area, its potential effect on residual standing trees, or my recommendations, please let me know. I can be reached at (928) 556-2074.

/s/ Joel D. McMillin
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cc: Deb Bumpus, Sharon I Wallace, Randall Chavez, Gayle Richardson, Joseph A Hamrick, John Anhold, Leonard Lucero, Debra Allen-Reid, Kathleen Klein, Edward Collins, Mailroom R3 Apache Sitgreaves

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